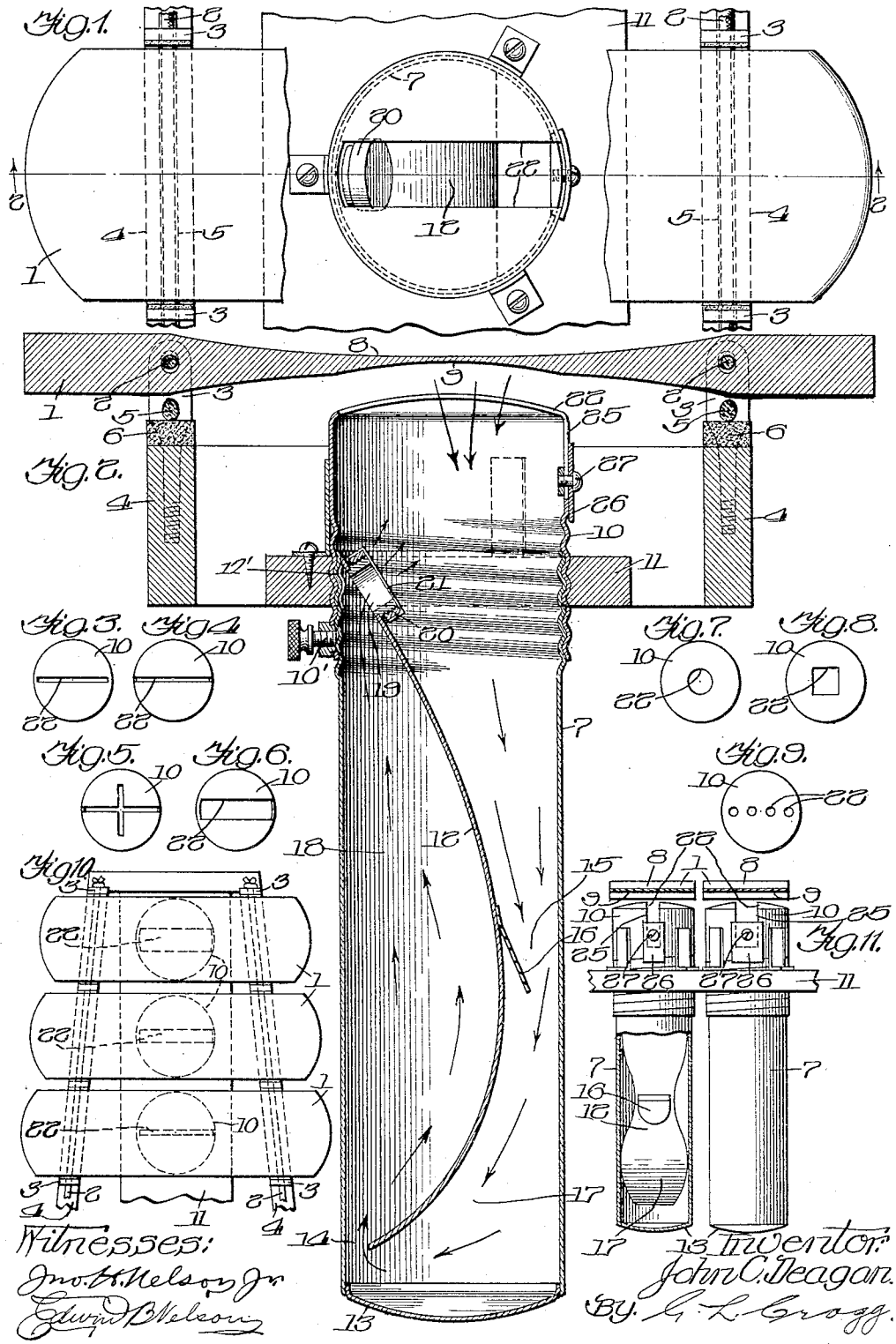
J. C. DEAGAN.

PIANO WITHOUT STRINGS.

APPLICATION FILED DEC. 19, 1913.

1,173,782. Patented Feb. 29, 1916.



THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN C. DEAGAN, OF CHICAGO, ILLINOIS.

PIANO WITHOUT STRINGS.

1,173,782. Specification of Letters Patent. Patented Feb. 29, 1916.

Application filed December 19, 1913. Serial No. 807,664.

To all whom it may concern:

Be it known that I, JOHN C. DEAGAN, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Pianos Without Strings, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to musical instruments and has a number of objects and advantages in view.

In accordance with one feature of the invention a row of adjacent resonating tubes is provided, the tubes or some of them having openings in end walls thereof which are contracted to form reduced exit openings for sound issuing from the tubes, the dimensions of the openings measured longitudinally of the row of tubes being less than the dimensions of said openings measured transversely of the row of tubes. Some of these openings are desirably continued transversely of the row of tubes along the walls of the tubes provided therewith.

Figure 1 is a plan view of a portion of the preferred form of musical instrument embracing my invention; Fig. 2 is a sectional view on line 2 2 of Fig. 1; Figs. 3, 4, 5, 6, 7, 8 and 9 are views illustrating certain modifications; Fig. 10 is a plan view of a part of the instrument; and Fig. 11 is a view in elevation, partially in section, of a part of the equipment illustrated in Fig. 10.

Like parts are indicated by similar characters of reference throughout the different figures.

The vibrating bodies 1 of the instrument, in this case a xylophone, are made of wood, metal, or other suitable vibrating material. These vibrating bodies are mounted in any suitable manner as for example upon cordage 2 which is preferably elastic and which passes through the supporting posts 3 mounted upon the rails 4, the cords 2 thus constituting cushion supports permitting of the vibration of the bars, these cushion supports being located at nodal points. Supplemental cushion supports 5 which are preferably in the form of cords that are not materially elastic underlie the bars 1 at their nodal points, that is they underlie the elastic cords 2, the supplemental cushions 5 closely approaching the nether surfaces of the bars 1 and being preferably in contact with the top surfaces of strips 6 of cushion felt which are placed upon the tops of the rails 4 to act as cushions yieldingly to limit the extent to which the supplemental cushions 5 may be depressed by the sounded bar 1 above the same, the supplemental cushions 5 being in such close proximity to the bars and cushion strips 6 as to enable the said cushion strips yieldingly to oppose the downward movement of the bars through the intermediation of the supplemental cushions 5. Normally however, slight clearance desirably intervenes between said supplemental cushions and the lower surfaces of the bars, while said supplemental cushions 5 are desirably permanently in contact with the cushion strips 6. The supplemental cushions 5 also operate as emergency cushions to support the bars in the event of the breakage of the main cushions 2, such breakage being of frequent occurrence.

The instrument illustrated includes a resonating tube 7 underlying each bar 1 and which is open at its top end to permit of the entry therein of sound waves set up by the bar when set into vibration. The bar may be set into vibration by any suitable means, as for example by means of a padded hammer impinged thereupon at the center of the bar which is in line with the axis of the resonating tube. One of the main depressions 8, such as the lower one, is provided with a supplemental depression 9 in the form of an additional repression, this additional depression 9 being centrally located immediately over the mouth of the resonating tube 7 and making the middle portion of the bar very thin. The resonating tube thus receives a much larger portion of the sound producing waves than hitherto.

The resonating tube is made vertically adjustable, to which end it is adjustably received within the bore of a supporting tube 10 directly secured to a fastening rail 11 which is supported at its ends upon the framework of which the side rails 4 form parts. The receiving tube 10 has a threaded formation in threaded engagement with the corresponding threaded formation in the tubular portion 7. By turning the tubular portion 7 in the proper directions this portion may be either raised or lowered as desired to effect tuning adjustment, the adjustment which is effected being maintained by the set screw 10^1. The effective length of the tube is increased by providing a trans-

versely straight diaphragm 12 therein, the lower end of this diaphragm terminating above the curved bottom 13 of the tube 7 in close proximity to this bottom and in close proximity to one side of the tube 7 whereby a constricted passage is afforded at 14 for the propagation of sound waves. The intermediate portion of the diaphragm 12 closely approaches the other side of the tube 7 there to afford another constricted passage or throat 15 whose effective area may be adjusted by means of a flexible non-resilient tongue 16 which is readily adjusted in position merely by bending with the aid of some suitable tool such as a hook. The expansion chamber 17 intervenes between the parts 14 and 16. After the sound has passed through the passage 14 it enters the expansion chamber 18 which terminates at its upper end in a nipple 19 with which a mounting ring 20 is in threaded connection. Mounting ring 20 carries an imperforate vibrant diaphragm 21 desirably formed of very thin split sheep-skin, the diaphragm 21 being located closely adjacent the top of the tube 7 so that the sound waves set up by the diaphragm, consequent upon the impingement of the sound waves in the chamber 18 thereupon, are free to find exit through the top of the tube to the exterior of the instrument. The diaphragm 21 thus covers an opening in the rigid diaphragm 12 whereby the incoming sound waves are forced to pass through the passages 15 and 14 and thereby directed against the under face of the diaphragm 21. The elements 7, 10, 12, and 16 are desirably so rigid that they do not themselves materially vibrate, whereby the diaphragm 21 solely receives the effect of the sound waves propagated by the associate bar 1, the tension of the diaphragm being adjustable to adjust its vibration by turning the collar 20 to vary the pressure exerted between the thimble 19 and the diaphragm 21. By means of the construction within the tube 7 which I have described, the same effects are produced as with a tube several times as long.

I provide openings in the upper end walls of the tubes which extend more laterally of the instrument than longitudinally thereof, the relative arrangement of such openings being indicated at 22 in Fig. 10. In Figs. 3 to 9 inclusive, the openings 22 therein at least do not extend longitudinally of the instrument more than laterally of the instrument and preferably extend wholly laterally of the instrument or, as illustrated in Fig. 5, predominately laterally of the instrument, the shorter slot there shown extending longitudinally of the instrument.

In some forms of the invention, the opening 22 is continued down along one side of the composite resonating tube (composed of elements 7 and 10) whereby an outlet portion 25 extends longitudinally of the tube. Portions of the tube opposite the slot portion 25 are unslotted to afford a sound reflecting surface aiding in propagating the sound waves through the tube laterally of the instrument. The slot portion 25 is made adjustable in length by means of a valve 26 whose position may be shifted longitudinally of the tube and which position may be secured by a clamping device 27. The elements 26 and 27 may also be employed for effecting pitch adjustment of the resonating tube 7. In other words there is provided a musical instrument including a plurality of adjacent resonating tubes whose bores are contracted at the top openings through which sound waves pass through the tubes.

The novel characteristics herein shown but not claimed are claimed in my copending applications Serial No. 807,663, filed December 19, 1913 and Serial No. 818,773, filed February 14, 1914.

While I have herein shown and particularly described the preferred embodiment of my invention I do not wish to be limited to the precise details of construction shown as changes may readily be made without departing from the spirit of my invention, but

Having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

1. A musical instrument including a row of adjacent resonating tubes, some of the tubes having end walls with exit openings for sound issuing from the tubes, the dimensions of the openings measured longitudinally of the row of tubes being less than the dimensions of such openings measured transversely of the row of tubes.

2. A musical instrument including a row of adjacent resonating tubes, some of the tubes having end walls with exit openings for sound issuing from the tubes, the dimensions of the openings measured longitudinally of the row of tubes being less than the dimensions of such openings measured transversely of the row of tubes, some of the openings being continued transversely of the row of tubes along the walls of the tubes provided therewith.

3. A musical instrument including a row of adjacent resonating tubes, some of the tubes having end walls with exit openings for sound issuing from the tubes, the dimensions of the openings measured longitudinally of the row of tubes being less than the dimensions of such openings measured transversely of the row of tubes, some of the openings being continued transversely of the row of tubes along the walls of the tubes provided therewith, the continued openings in some of the tubes extending along but one side of each of these tubes whereby more effective reflecting surfaces

are afforded opposite the continued portions of these latter openings.

4. A musical instrument including a resonating tube having a sound inlet opening; a curved diaphragm therein extending from one side of the tube toward the other and returning toward the first side, there being an opening in said diaphragm; a collar carried by the diaphragm whose opening is alined with said opening; a cap adjustable longitudinally of the collar toward and from the diaphragm; and a thin vibrant diaphragm carried by the cap and adapted to be pressed with varying pressure against the adjacent edge of the collar according to the adjustment of the cap.

5. A musical instrument including a resonating tube having a sound inlet opening; a diaphragm therein extending from one side of the tube toward the other, there being an opening in said diaphragm; a collar carried by the diaphragm whose opening is alined with said opening; a cap adjustable longitudinally of the collar toward and from the diaphragm; and a thin vibrant diaphragm carried by the cap and adapted to be pressed with varying pressure against the adjacent edge of the collar according to the adjustment of the cap.

6. A musical instrument including a row of adjacent resonating tubes, some of the tubes having end walls with exit openings for sound issuing from the tubes, the dimensions of the openings measured longitudinally of the row of tubes being less than the dimensions of such openings measured transversely of the row of tubes; and sound producing vibrating bars mounted at those ends of the tubes where said reduced exit openings are provided.

7. A musical instrument including a row of adjacent resonating tubes, some of the tubes having end walls with exit openings for sound issuing from the tubes, the dimensions of the openings measured longitudinally of the row of tubes being less than the dimensions of such openings measured transversely of the row of tubes, some of the openings being continued transversely of the row of tubes along the walls of the tubes provided therewith; and sound producing vibrating bars mounted at those ends of the tubes where said reduced exit openings are provided.

8. A musical instrument including a row of adjacent resonating tubes, some of the tubes having end walls with exit openings for sound issuing from the tubes, the dimensions of the openings measured longitudinally of the row of tubes being less than the dimensions of such openings measured transversely of the row of tubes, some of the openings being continued transversely of the row of tubes along the walls of the tubes provided therewith, the continued openings in some of the tubes extending along but one side of each of these tubes whereby more effective reflecting surfaces are afforded opposite the continued portions of these latter openings; and sound producing vibrating bars mounted at those ends of the tubes where said reduced exit openings are provided.

9. A musical instrument including a row of adjacent resonating tubes, end walls of some of the tubes having reduced exit openings for sound issuing from the tubes, the dimensions of the openings measured longitudinally of the row of tubes being less than the dimensions of such openings measured transversely of the row of tubes, some of the openings being continued transversely of the row of tubes along the walls of the tubes provided therewith and having means to adjust the length of the continued portions of the openings.

In witness whereof, I hereunto subscribe my name this 20th day of November, A. D. 1913.

JOHN C. DEAGAN.

Witnesses:
G. L. CRAGG,
ETTA L. WHITE.